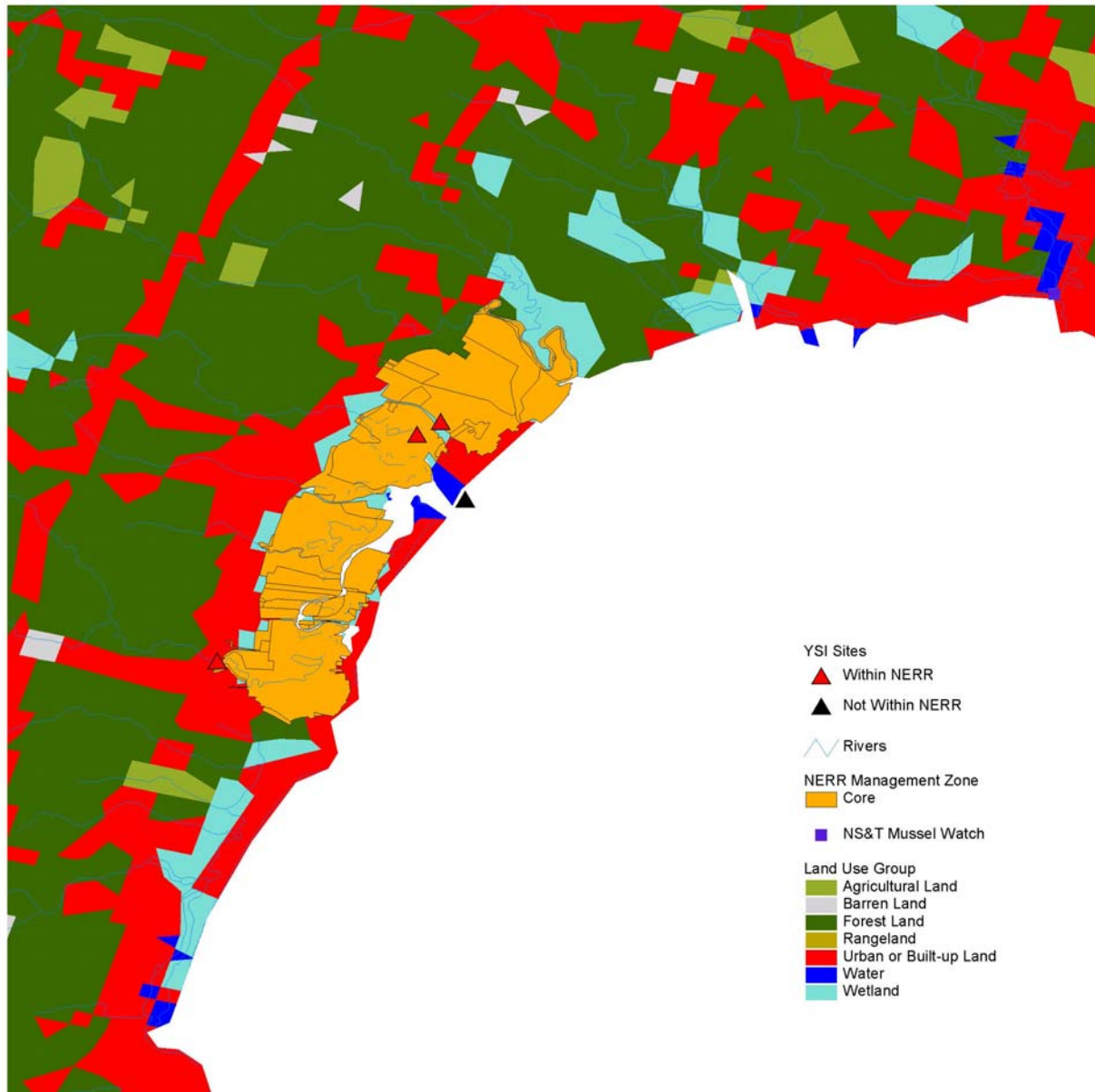


Wells



Wells, Head of Tide (WELHT)

Characterization (Latitude = 43°17'54"N; Longitude = 70°35'14"W)

Tides at Head of Tide are semidiurnal and range from 2.6 m to 2.9 m (average 2.6 m). This site is located 4 miles south of the Wells Reserve, just downstream of the Webhannet Falls (freshwater) and 10 feet east of Route One. The creek/waterbody is 2,443 m long (mainstream linear dimension), has an average depth of 1.3 m MHW, and an average width of 224 m. At the sampling site, the depth is 0.36 m MHW and the width is 8.5 m. Creek bottom habitats are predominantly soft mud, sand, and rocky substrate with no bottom vegetation. The dominant marsh (brackish marsh) vegetation near the sampling site includes *Spartina pectinata*, *Typha angustifolia*, and *Potentilla angerina*. The dominant upland vegetation includes *Acer rubrum*, *Betula lenta*, *Pyrus malus*, *Syringa vulgaris*, *Prunus* sp., and *Lonicera* sp. Upland land use near the sampling site includes the Route One Bridge directly over the site, a seasonal farm stand, and a small parking area overlooking the Webhannet River waterfall. Activities that potentially impact the site include runoff from Route One (heavily used from the late spring through early fall), a gas station south of the site and a large plaza/grocery area just north of the site. On occasion, elver nets are placed adjacent to the sampling site. The headwaters of Webhannet are relatively undeveloped.

Descriptive statistics

Twenty-two deployments were made at this site between Apr-Dec 1996, Mar-Dec 1997, and Apr-Nov 1998 (Figure 78). Mean deployment duration was 31.2 days. Only one deployment (Aug 1996) was less than 20 days.

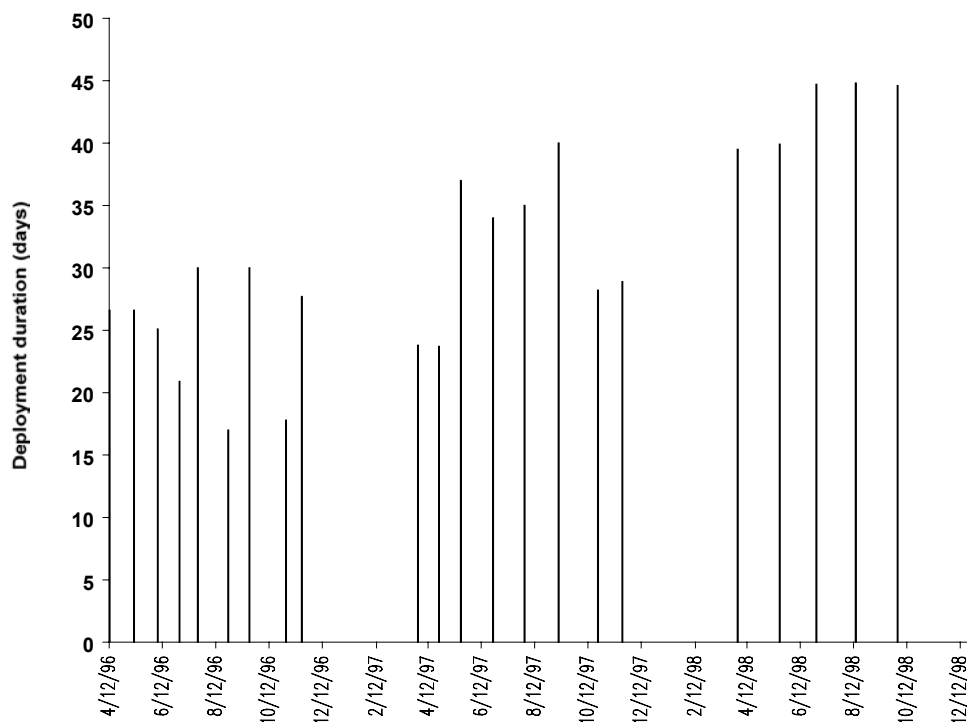


Figure 78. Wells, Head of Tide deployments (1996-1998).

Sixty-five percent of annual depth data were included in analyses (61% in 1996, 69% in 1997, and 66% in 1998). Sensors were deployed at a mean depth of 0.4 m below the water surface and 0.3 m above the bottom sediment. Scatter plots suggest strong fluctuations (≥ 0.8 m) in water depth throughout the data set, except for Mar 1997 (0.2 m). Harmonic regression analysis attributed 68% of depth variance to 12.42 hour cycles, 23% of depth variance to interaction between 12.42 hour and 24 hour cycles, and 9% of depth variance to 24 hour cycles.

Sixty-five percent of annual water temperature data were included in analyses (61% in 1996, 69% in 1997, and 66% in 1998). Water temperature followed a seasonal cycle; however, annual minimum water temperatures were not known because no data were collected in winter (Figure 79). Mean water temperature was 4-13°C in Apr-May, 15-18°C in Jun-Sep, and 1-10°C in Nov-Dec. Minimum and maximum observed water temperature between 1996-1998 was -0.8°C (Dec 1998) and 26.1°C (Jul 1998), respectively. Scatter plots suggest strong fluctuation (5-10°C) in daily and bi-weekly water temperatures throughout the data set, except for Dec 1996 and 1997 and May 1997 when fluctuations were $< 5^{\circ}\text{C}$ and 15°C , respectively. Harmonic regression analysis attributed 48% of temperature variance to 24 hour cycles, 35% of temperature variance to interaction between 12.42 hour and 24 hour cycles, and 17% of temperature variance to 12.42 hour cycles.

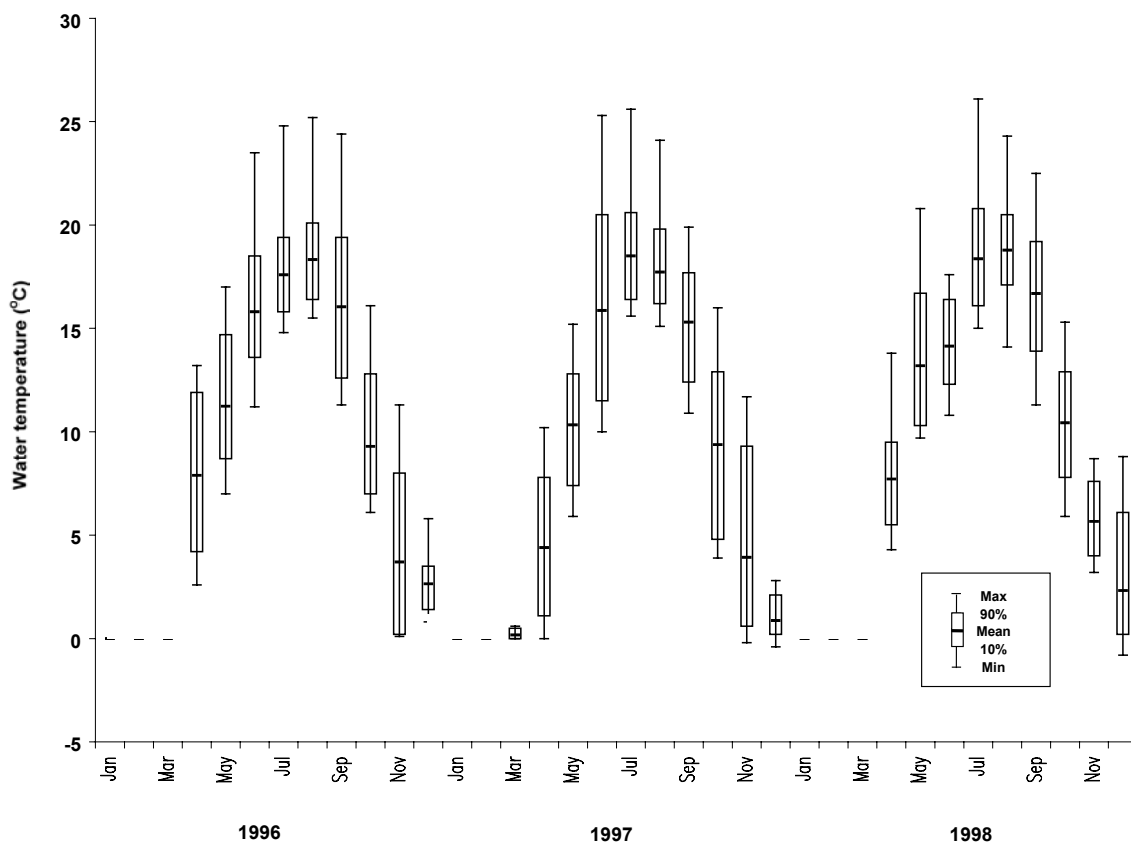


Figure 79. Water temperature statistics at Head of Tide, 1996-1998.

Sixty-five percent of annual salinity data were included in analyses (61% in 1996, 69% in 1997, and 66% in 1998). Large variances (7-30 ppt) were associated with mean salinity throughout the data set (Figure 80). Mean salinity was 0-5 ppt, except in Aug-Sep 1996 (7-14 ppt), Jul-Sep 1997 (6-7 ppt), and Sep 1998 (10 ppt). Minimum salinity regularly approached 0 ppt. Maximum salinity observed between 1996-1998 was 29.8 ppt (Aug 1996). Scatter plots suggest daily and bi-weekly fluctuations in salinity equivalent to, or in excess of, annual variation in mean salinity. Harmonic regression analysis attributed 43% of salinity variance to 12.42 hour cycles, 17% of salinity variance to 24 hour cycles, and 40% of salinity variance to interaction between 12.42 hour and 24 hour cycles.

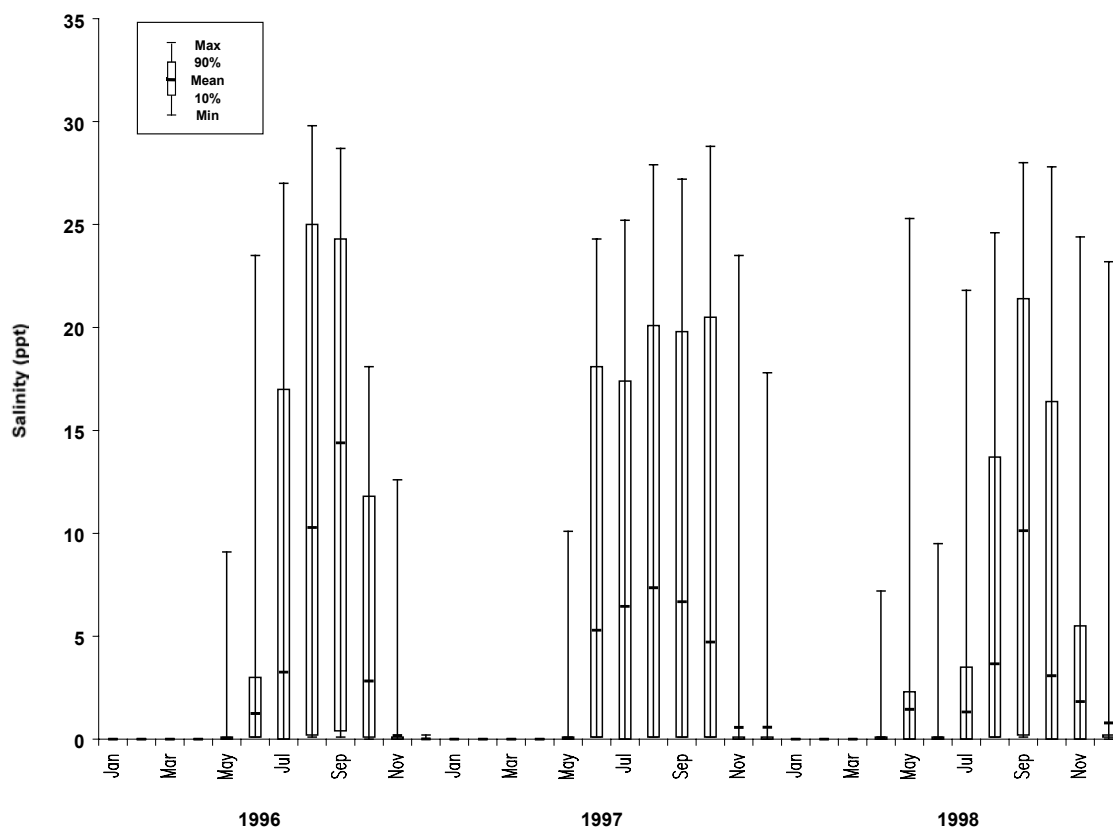


Figure 80. Salinity statistics at Head of Tide, 1996-1998.

Fifty-four percent of annual dissolved oxygen data (% saturation) were included in analyses (54% in 1996, 51% in 1997, and 58% in 1998). Mean DO was 65-112% saturation throughout the data set, with no apparent seasonal cycle. Minimum and maximum DO between 1996-1998 was 20.4% saturation (Jul 1997) and 201.2% saturation (Aug 1998), respectively. Hypoxia was observed in one month (Oct 1997) and persisted for 1% of the first 48 hours post-deployment (Figure 81). Supersaturation was observed in four months (Aug 1996, Jun-Jul 1997, and Aug 1998) and, when present, supersaturation persisted for 2.8% of the first 48 hours post-deployment on average. Scatter plots suggest moderate fluctuations ($\leq 60\%$) in percent saturation throughout the data set, except during episodic events in summer 1996-1998 when fluctuations $\geq 100\%$ were observed. Harmonic regression analysis attributed 45% of DO variance to interaction between 12.42 hour and 24 hour cycles, 43% of DO variance to 24 hour cycles, and 12% of DO variance to 12.42 hour cycles.

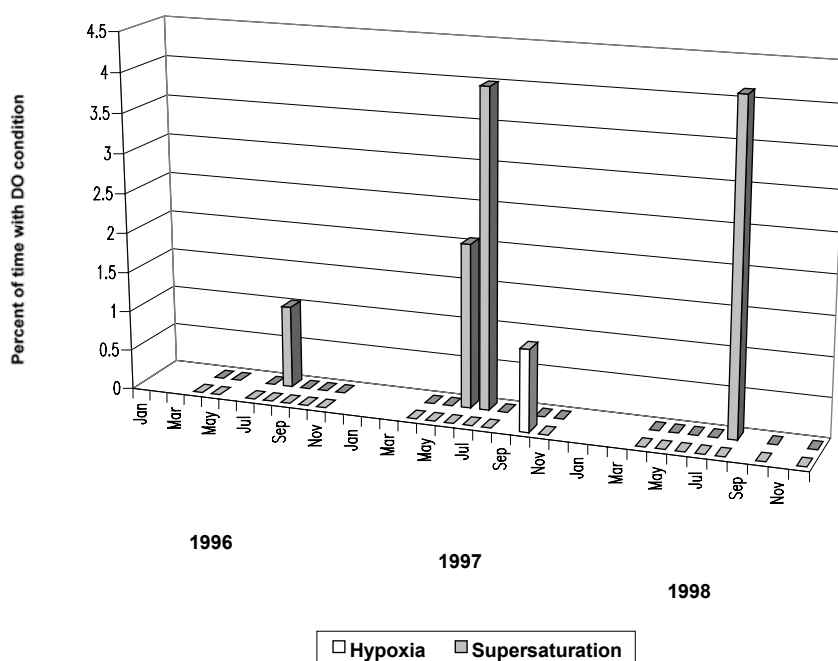


Figure 81. Dissolved oxygen extremes at Head of Tide, 1996-1998.

Wells, Inlet Site (WELIN)

Characterization (Latitude = 43°19'12"N; Longitude = 70°33'48"W)

Tides at the Inlet site are semidiurnal and range from 2.6 m to 2.9 m (average 2.6 m). This site is located 1.5 miles south of the Wells Reserve, at the Wells Harbor pier. The water body is 2,443 m long (mainstream linear dimension), has an average depth of 1.3 m MHW, and an average width of 224 m. At the sampling site, the depth is about 2.54 m MHW and the width is 500 m. Creek bottom habitats are predominantly sand with no bottom vegetation (some *Mytilus edulis* reefs). The dominant marsh vegetation near the sampling site is *Spartina alterniflora* and *Spartina patens*. There is a mixture of *Pinus strobus* and *Populus tremuloides* colonizing a large dredge area near the site. Upland land use near the sampling site includes Wells Harbor, which was most recently dredged in 1971, has moorings for approximately 200 commercial fishing and recreational boats, a boat repair facility, and a restaurant directly adjacent to the site. Close proximity to extensive development surrounding the mouth of the Webhannet salt-marsh estuary is the activity most likely to negatively impact this site. The shoreline surrounding this site is highly developed with motels, restaurants, private homes and seasonal rentals, and heavily used public beaches.

Descriptive statistics

Thirty-three deployments were made at this site between Jan 1996 and Nov 1998, with equal coverage during all months (Figure 82). Mean deployment duration was 29.4 days. Only three deployments (Apr 1996, Jun 1996, and Jan 1997) were less than 20 days.

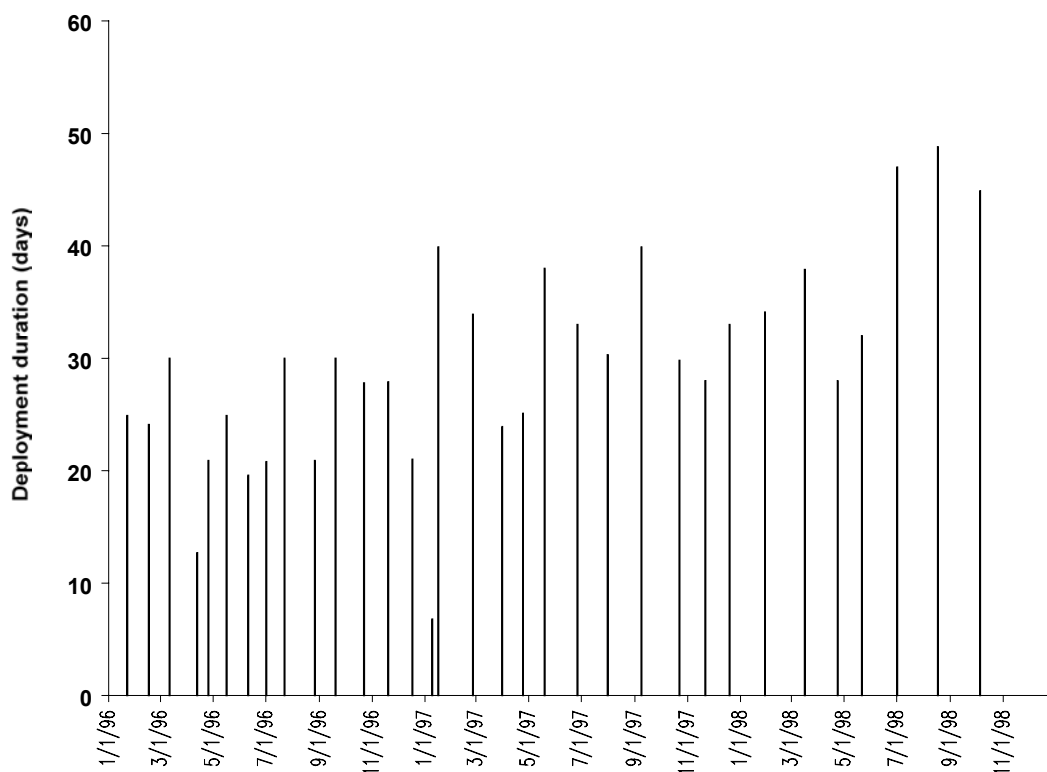


Figure 82. Wells, Inlet Site deployments (1996-1998).

Eighty-nine percent of annual depth data were included in analyses (93% in 1996, 95% in 1997, and 78% in 1998). Sensors were deployed at a mean depth of 2.6 m below the water surface and 1.0 m above the bottom sediment. Scatter plots suggest strong fluctuations in depth (≥ 3 m) throughout the data set, except for Jan 1996 (~ 2 m). Harmonic regression analysis attributed 96% of depth variance to 12.42 hour cycles, 3% of depth variance to 24 hour cycles, and 1% of depth variance to interaction between 12.42 hour and 24 hour cycles.

Eighty-eight percent of annual water temperature data were included in analyses (93% in 1996 and 1997, 78% in 1998). Water temperature followed a seasonal cycle, with mean water temperatures 1-3°C in winter and 15-17°C in summer (Figure 83). Minimum and maximum water temperature between 1996-1998 was -1.8°C (Jan 1996) and 23.1°C (Jul 1997), respectively. Scatter plots suggest strong fluctuations in daily ($\leq 5^\circ\text{C}$) and bi-weekly (5-10°C) water temperatures, with strongest fluctuations occurring in spring and summer. Harmonic regression analysis attributed 48% of temperature variance to 12.42 hour cycles, 33% of temperature variance to interaction between 12.42 hour and 24 hour cycles, and 19% of temperature variance to 24 hour cycles.

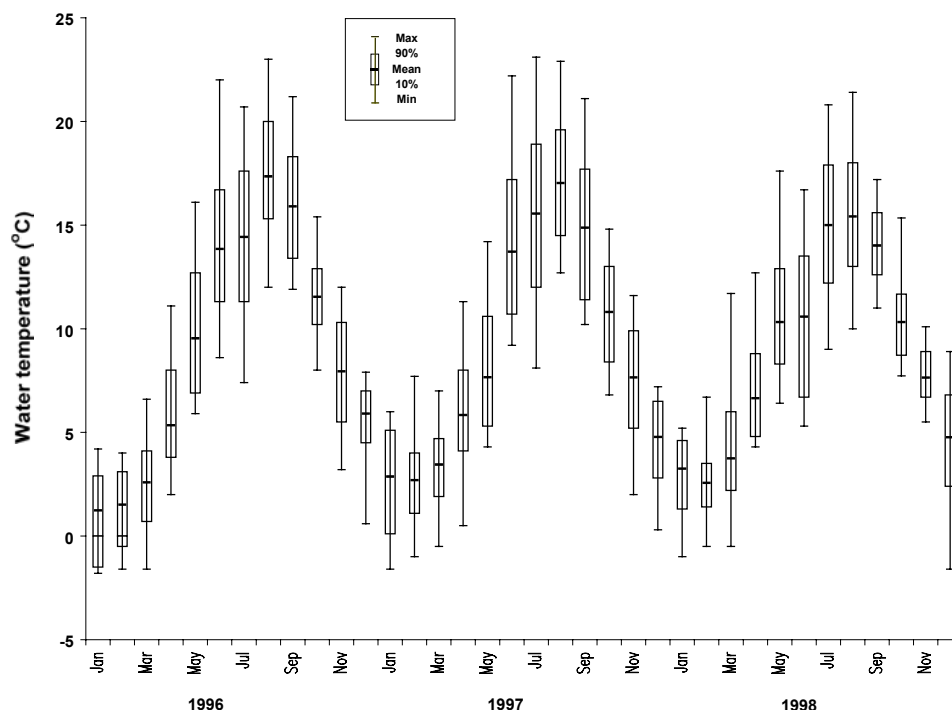


Figure 83. Water temperature statistics at Inlet Site, 1996-1998.

Eighty-eight percent of annual salinity data were included in analyses (93% in 1996 and 1997, 78% in 1998). Mean salinity was 28-34 ppt; however, large variances were associated with mean salinity values throughout the data set (Figure 84). Minimum and maximum salinity between 1996-1998 was 0.5 ppt (Oct 1998) and 36 ppt (Feb 1997), respectively. Scatter plots suggest fluctuations in daily and bi-weekly salinity equivalent to, or in excess of, annual variation in mean salinity (except for Jul-Aug 1996, May, Aug, and Sep 1997, and Aug 1998). Harmonic regression analysis attributed 91% of salinity variance to 12.42 hour cycles, 6% of salinity variance to interaction between 12.42 hour and 24 hour cycles, and 3% of salinity variance to 24 hour cycles.

Eighty-five percent of annual dissolved oxygen (% saturation) data were included in analyses (93% in 1996, 85% in 1997, and 78% in 1998). Mean DO was 60-113% saturation throughout the data set. Minimum and maximum DO between 1996-1998 was 0.4% saturation (Nov 1998) and 145.3% saturation (Oct 1997), respectively. Hypoxia was observed in six months in 1998 and, when present, hypoxia persisted for 14.2% of the first 48 hours post-deployment on average (Figure 85). Supersaturation was observed once in 1996, once in 1998, and in five months in 1997. Except for Jul 1997, when supersaturation persisted for 58% of the first 48 hours post-deployment, super-saturation persisted for 3.9% of the first 48 hours post-deployment on average when present. Scatter plots suggest moderate fluctuations in percent saturation (20-80%) in 1996-1997 and winter 1998, but strong fluctuations in percent saturation (80-120%) in spring, summer, and fall 1998. Harmonic regression analysis attributed 68% of DO variance to 12.42 hour cycles, 14% of DO variance to 24 hour cycles, and 18% of DO variance to interaction between 12.42 hour and 24 hour cycles.

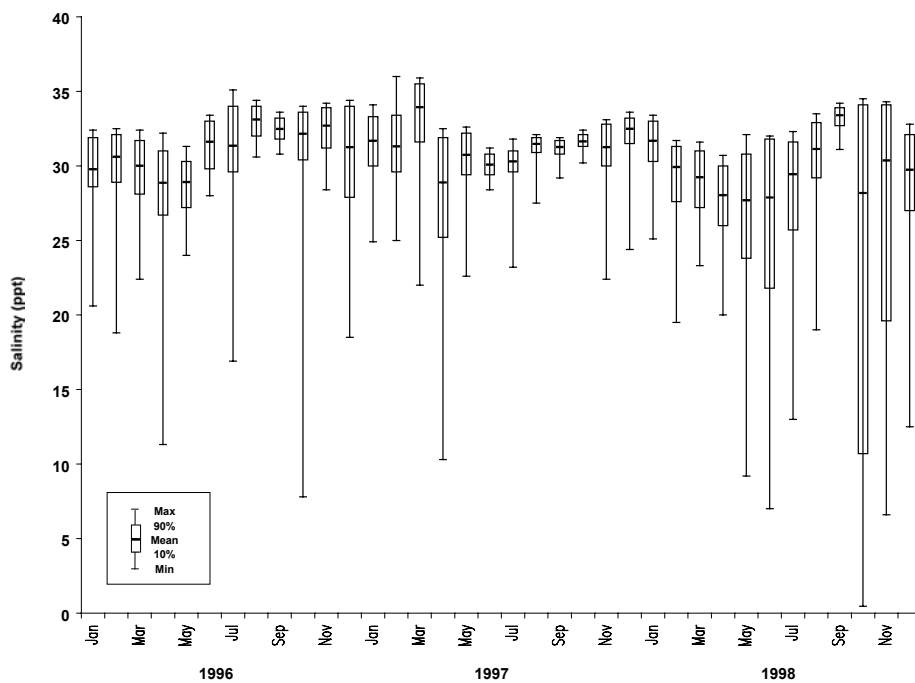


Figure 84. Salinity statistics at Inlet site, 1996-1998.

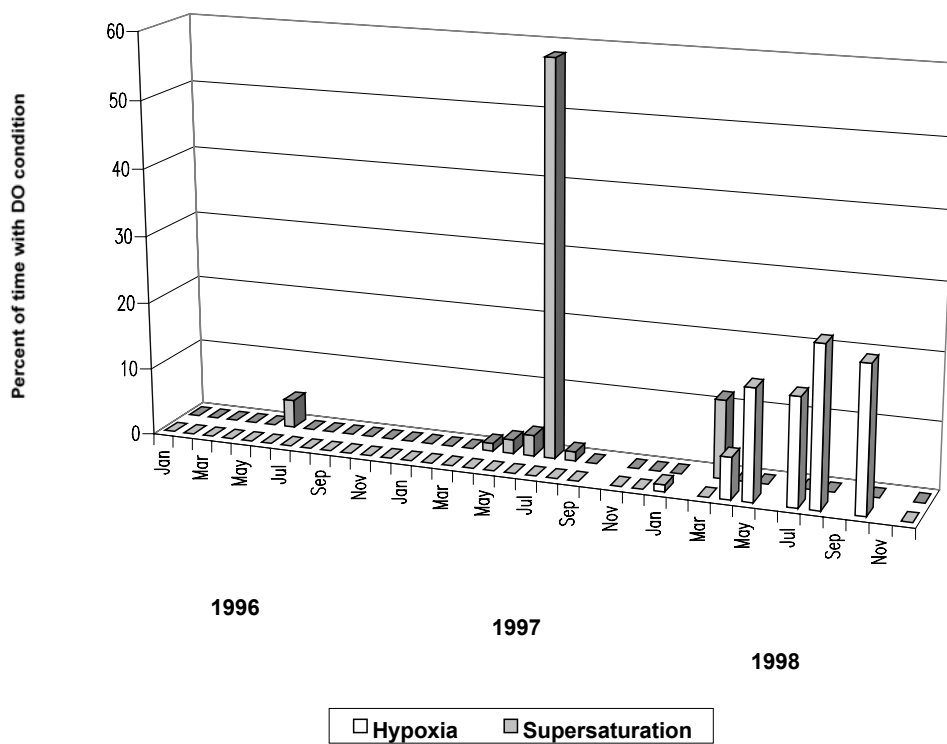


Figure 85. Dissolved oxygen extremes at Inlet site, 1996-1998.